

In 1900, the average American could expect to live to about 48 years of age. At the beginning of the 20th century, the leading causes of death were pneumonia, influenza, and tuberculosis. Improvements in nutrition and health care have allowed that number to rise steadily over the decades. Now, the average life expectancy for Americans has risen to 78.5 years. Americans today are most likely to die from heart disease, cancer, or respiratory disease. With the threats of such illnesses, a question begs to be answered: What medical development holds the most promise for improving Americans' health?

Many believe that the answer to a longer, healthier life rests with stem cells.

Stem cells have a special ability. They can transform into any type of cell. Say someone has a spinal cord injury, or perhaps a cancer patient has cells that have been damaged by chemotherapy or radiation. Stem cells can be used to replace those damaged cells. Stem cells can return damaged tissues and organs to full operation.

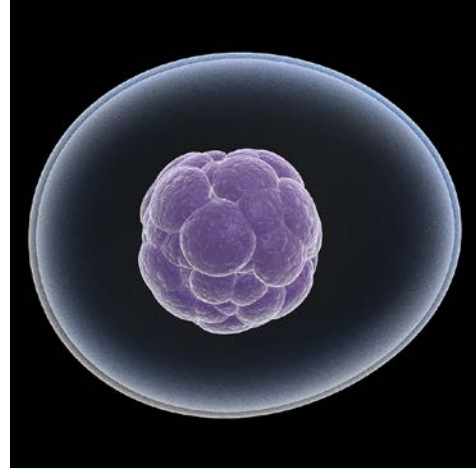
### **How Do Stem Cells Work?**

Stem cells are different from other cells in the body. They divide and renew themselves for extremely long times. They are not specialized, or differentiated. Rather, they become specialized cells in order to perform a certain function for the body.

Stem cells are placed into areas of the body that have been damaged. The cells go through several stages. At each stage, they become increasingly specialized. This allows them to do a certain job. Signals from the stem cell's genes tell it how to develop. The stem cell receives other signals from the cells around it through chemicals originating from those cells. It gets other information when it touches the other cells. So the cell can tell if it is supposed to grow into a new brain cell, a new kidney cell, or some other kind of cell. An organ can work again without the need for a transplant.

### **Pros and Cons of Stem Cell Use**

Stem cell therapy can greatly alter the way we treat illness and disease. Like any treatment, however, it is not perfect. Scientists



Stem cells like this one have the ability to become different kinds of cells. They replace damaged or destroyed cells in the human body.

recognize that stem cell research has pros, or benefits, and cons, or potential drawbacks.

The chief benefits of stem cell use lie in regenerative medicine and cloning. Instead of finding replacement organs for diseased body parts, stem cells may be used to repair and regenerate a damaged organ. Stem cells have been shown to be useful in treating Parkinson's disease and Alzheimer's disease. They may help heal patients with cancer or spinal cord injuries. Patients with traumatic brain injuries benefit greatly when stem cells replace damaged or dead brain cells. A patient might regain complete use of his or her brain after treatment.

Drug researchers see potential benefits of stem cell research, too. New prescription drugs can be tested on individual cells. This means that humans and animals will not have to be test subjects.

Also, stem cells can offer insight into stages of embryonic development that researchers cannot know directly. This may help women who have fertility problems. It could also reduce birth defects and pregnancy loss.

Another benefit of stem cell use is that it uses the patient's own cells. Following an organ transplant, the human body has a tendency to reject the new organ. This is because the organ has originated from outside the patient's body. Using the patient's own cells helps suppress the body's tendency to reject the transplanted organ.

There are also several potential costs to using stem cell therapy. First, the use of stem cells is very controversial. Stem cell research means that tiny blastocysts—cellular masses that form early in embryonic development—must be destroyed. To some, these blastocysts represent human lives. Religious and human rights activists argue that stem cell research destroys embryos. They worry that it is unethical to carry out a drug test or medical procedure on any human being, even one who has not yet been born. Animal rights activists argue against stem cell use on the same grounds.

Also, the long-term side effects of stem cell use are unknown. This is a relatively young science, so no one knows what will happen to

patients who use stem cell therapy 50 years after the treatment.

## **Political Debate**

The use of stem cells has stirred up considerable heated political debate. All over the world, governments are creating guidelines and laws about stem cell research. In the United States and Canada, scientists cannot create embryos for research. They must use existing embryos that couples trying to become pregnant do not want.

Much of the debate centers on methods to fund stem cell research. The federal government provides billions of dollars each year to help medical research. But stem cell use has raised important moral and ethical issues. The government struggles to balance its desire to assist scientific research with its need to protect human life.

At the national level, the debate is split somewhat along party lines. In 2001, former President George W. Bush severely limited federal funding for stem cell research. But President Barack Obama overturned Bush's policy in 2009. Many Democratic politicians favor stem cell research. The issue has divided many Republicans.

At the state level, a new trend is emerging. New Jersey, California, Connecticut, Illinois, Maryland, New York, and Wisconsin have committed state funding to stem cell research. They want to attract the best scientific talent and take the lead in an exciting new facet of medical research.

## **Potential Medical Uses of Stem Cells**

- Stem cells can be used to treat diseases such as heart disease and diabetes.
- Stem cells give us information about the earliest stages of human development, including how cells become specialized.
- Stem cells can be used to test new drugs before trials on full-grown humans are conducted.
- Stem cells can regenerate cells and tissues that are sick or have been destroyed.